FOREST PRODUCTS
Project Fact Sheet

CONTROL OF EMISSIONS FROM WOOD DUST BURNERS AND WOOD DRYERS

BENEFITS

- Enhances use of biomass in place of fossil fuels by industry
- Enhances use of wood waste high in fuel-bound nitrogen
- Controls emissions from burner-dryer systems cost-effectively
- Reduces energy costs
- Lowers greenhouse gas emissions
- Reduces annual NOx emissions by 11,500 tons with a 50% control rate
- Potentially reduces NOx emissions by 30 to 70% from wood dust burners
- Increases throughput of NOx-limited facilities
- Allows use of wood dust as a reagent for NOx control

APPLICATIONS

Interaction is underway with wood burner manufacturers and operators to apply the results of this study.

New Methods Will Help Control NOx and VOC Emissions at Wood-Burning Facilities

Seven hundred wood dust burners are operated in North America and are responsible for a significant fraction of the nitrous oxides (NOx) emitted during the burning of industrial wood waste. Similar levels of VOCs are emitted from wood dryers. NOx is also emitted from hog-fuel and coarse-wood burners. Reducing the release of photochemical oxidants and aerosols into the atmosphere will help reduce ozone and acid rain formation, and mitigate the effects of wood burning activities by industry.

Researchers at the University of Washington will study methods to control these emissions, using their laboratory data to conduct modeling, engineering analysis, and field-burner data obtained from the forest products industry.

It is cost-effective to the industry to control emissions during combustion rather than pay for exhaust denitrification by selective catalytic reduction. The combined approach of combustion control of NOx and dryer control of VOCs may be as effective in controlling photochemical-precursors as removing VOCs from dryer exhaust by regenerative thermal oxidizers.

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PROJECT DESCRIPTION

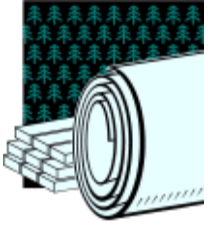
Goal: To conduct an engineering/computational analysis of cost-effective methods for reducing environmental emissions from wood waste combustion systems and to apply the results to burners in the field.

Objectives of the three-year project are: 1) develop cost-effective methods for reducing NOx emissions from wood-suspension burners and burners fired on hog fuel and coarse wood. Experimentation is complicated by co-firing with dust while minimizing the side effects of carbon monoxide, carbon emissions, and ash slagging; 2) explore the re-burning and de-NOx potentials of wood dust; and 3) determine the effect of the hot gas inlet stream on pollutant behavior in the dryer (especially the NO-to-NO2 conversion and its viability for NOx control) and examine the integrated burner/dryer system for minimal emission of total NOx and VOCs.

An approach will be developed for controlling emissions, based on laboratory data, field data, computational analysis, and engineering analysis. Chemical reactor modeling (CRM) software will analyze laboratory and field data, ultimately developing methods for predicting exhaust emissions and their control. Computational fluid dynamics (CFD) software will be used to analyze particular burner configurations for emissions reduction.

PROGRESS & MILESTONES

- The experimental phase of the research was completed in 1997–98 at the University of Washington, sponsored by industry, and field burner data is also available.
- Researchers and interests in the pulp and paper products industry held discussions and concluded that a significant gap exists in the knowledge-base and modeling of dust burners.
- The parties agreed that their initial research efforts should be concentrated on the cyclonic dust burner because it is the most fertile area for research.
- Partnerships (unfunded) between the Weyerhaeuser Technology Center and the M-E-C Company have been formed.
- Investigators analyzed field burner data with computational fluid dynamics (CFD), developing a grid for the cyclonic wood dust burner and running trials of the DFD code called FLUENT.
- A CFD solution was obtained from various FLUENT-provided default values.
- The solution tended to under-predict the carbon burnout and exit temperature and over-predict the burner pressure drop. Thus, it was decided to try other turbulence models and reaction rate data.



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